“Stickiness” phenomenon in Greek listed firms from 2010 to 2018

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Abstract

This dissertation was written as part of the MSc in International Accounting, Auditing and Financial Management at the International Hellenic University. This thesis deals with the appearance or not of sticky behavior, namely if costs of goods sold rise more in a sales increase than they fall in an equal decrease in sales and this regards costs for small and medium-sized Greek businesses for the time period that the crisis almost began, that is, 2008-2018. The study focuses on assessing the cost behavior of a sample of Greek companies in Athens Stock Exchange under years of scrutiny. The results of the survey show that not only cost of goods sold does not follow sticky behavior, but in fact they follow an anti-stickiness behavior. This is due to the fact that an increase in sales does in fact affect the cost of goods sold to an increase, but an equal decrease in sales affects in a bigger decrease the cost of goods sold. In addition, the concept of sticky behavior is presented and analyzed, as well as the factors that drive and create this costological behavior at an operational, sectoral, and socio-political level through the presentation and interpretation of prior literature. Finally, I want to thank my supervisor Dr Archontaki, who was there for me every single time I needed him and supported me till the end. Also, I want to thank my parents who invested in my further knowledge and wait patiently with me for the results.

Keywords: cost stickiness, sales, cost of goods sold, cost behavior.

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1. Introduction

In the demanding and ever-changing field of entrepreneurship, it is crucial to have an effective understanding of cost behavior, especially in the area of cost accounting. Also, it is crucial to effectively implement the accounting procedures and policies used by each management in line with the strategy it seeks to pursue in the face of competition that deals with. Over the years, cost behavior has taken many forms according to the research conducted, most notably the classical model in which costs are described as fix cost or variable cost, relative to changes in activity volume. In this traditional form, costs change proportionally to changes in the cost or activity driver (Noreen 1991). However, in this alternative approach, while it is clearly stated that costs are affected and vary by the magnitude of the change in the business activity, no consideration is given to the direction in which such change is moving, i.e. if there is an increase or decrease movement. For this reason, the emergence of yet another theory of cost behavior involving the above shortage was of course a consequence. Cooper and Kaplan (1998) as well as Noreen and Soderstrom (1997) found that costs increase more with increases in activity than decrease with equal decreases in activity. This cost behavior has been termed “sticky” by Anderson et al (2003), and in particular the costs are considered sticky when their increase associated with an increase in activity is greater than their decrease which is associated with an equal decrease of activity. In the present study costs that are mechanically adapted to changes in activity are referred to as fix (engineered) costs and costs that are mainly dependent on management decisions are referred to as variable (committed) costs. Since the level of actual activity cannot exceed the capacity of the resources allocated by the management concerned, an increase in demand will put pressure on management to increase the costs that are committed. But a potential drop in demand will not put the administration in the same pressurized situation to reduce its committed costs. Sticky costs occur when committed resources are not reduced to the minimum required to support the decline in demand of this activity. Despite the rapid increase in studies investigating the phenomenon of sticky behavior, the findings have raised disagreements about the validity of the theoretical framework and the generalization

of this phenomenon (Balakrishnan et al, 2011). In particular, while the majority of research has documented several explanatory factors for stickiness behavior at business and national level, business size has not been adequately addressed as an important influencing factor. The objective of this study is to investigate if costs of sales (costs of goods sold) in Greek small and medium sized enterprises are sticky in relation to sales changes. The research contribution to the already extensive literature is important because it provides evidence for how cost structure characteristics can influence sticky behavior. These features vary depending on the size of the business, thus providing a more sophisticated analysis that links the size of the business to the cost behavior. So, we should first understand how cost is structured. Operating expenses and costs of sales are types of costs that, with some minor or major constraints, are adjusted by administrations and are therefore influenced by management behavior. While the research provides evidence of anti-sticky behavior of sales cost in Greek Small and Medium Companies thereby offering an additional understanding of cost behavior in an economy with particularities that has not been so extensively examined in the sticky phenomenon.

1.1. Key words

In order the theory to be fully understood, it is crucial to have a deep understanding at some key words.

- Stickiness is a term in economics that shows the resistance to changes. Most of the times it is a phenomenon that comes up with prices that although demand and supply changes or there are economic changes (e.g. financial crisis) the prices remain the same.
- Sales are the amount of goods sold and from this transaction revenue is generated.
- Cost of goods sold is the cost that is directly connected with the production of a good or a service in a company (e.g. material costs, rent costs, payroll etc).

2. Literature Review

In this particular paper there is the need to interpret whether cost stickiness phenomenon exist in a sample of Greek Companies in a time horizon of ten years (2008-2018). This phenomenon seems to have been an interesting issue for many researchers. From classical theory it was well known that cost is influenced by changes in activity and that is being explained through the survey of Noreen(1991). Cooper and Caplan wanted to investigate this is a little further, and there is an explanation analyzed for the direction of this influence between cost and changes in activity. The results of those researchers came up with the name of stickiness. Anderson, Banker and Janakiraman(2000) conclude that costs are labeled as sticky when the percentage increase in costs from an increase in the cost driver is greater than the decrease in costs from a proportionate reduction in the cost driver (revenue). Also, the asymmetric behavior between costs and the cost driver was investigated from them and is being analyzed further. A further analysis will be explained for the correlation between the phenomenon of cost stickiness and managers' behavior that has been introduced by Banker & Byzalov and from Coper and Caplan. Cost behavior and whether it depends on the absolute magnitude of the change in revenue was made by Subranamian and Weidenmier in 2003. Cooper & Kaplan (1998) and Banker & Byzalov studied the correlation between the phenomenon of cost stickiness and managers' behavior. Chen, Lu & Sougiannis, (2011), analyze the asset change management choices and Eldenburg, (2005), also connect the cost stickiness phenomenon with agency problems in their study. Cohen, Karatzimas & Naoum, (2015), confirm the cost stickiness trend which shows evidence of cost action in Greek local governments, conclude that local government managers are changing the cost of service provision (core activity) faster. The evaluation and analysis of sticky behavior was also researched nationally by Medeiros and de Souza Costa (2004) and Calleja et al. Chen (2012) provides evidence that there has been a positive correlation between the degree of stickiness and representation problems. Cannon (2011), explains that behavioral stickiness is more pronounced in terms of earnings when administrations drop prices in times of high demand and less strongly when prices rise in times of demand. Balakrishnan, Peterson,

and Soderstrom (2004) conduct the idea that the change in the size of the economic activity is affecting and is the cause of the appearance of stickiness. Venieris (2015) introduces the idea than an important factor in the appearance of stickiness is the competences, skills of the members who make the key decisions and shape the strategy. Ballas (2015) studied the effect of stickiness on the costs of disposal and administration in companies that designate prospectors and defenders, according to their strategy. Alternative theories that combine stickiness with labor are explained from the surveys of Jamilio, Schiantareli and Sembeneli (1993) and Goux, Marin and Panchel (2001).Finally, other researchers such as by Guanter, Riehl and Robler (2014) analyzed if the stickiness phenomenon is influenced from reputation of the company.

2.1. Structure of the Dissertation

Firstly, there is an analysis of the literature review and a wide explanation to get to know with the phenomenon that is explained. Afterwards, factors that influence stickiness behavior and other theories that concerns sticky behavior are explained. After this theoretical background comes the case development and the analysis of the issue that is explained. Finally, there are the conclusions and the appendix is presented.

2.2. Cost behavior

In traditional theory the costs associated with an activity (cost driver) can be considered as either variable or fixed over the scope of the activity. The variable costs exhibit a proportional behavior that is dependent on the change in activity, which means that with a potential 1% increase in activity then the costs associated with this activity will increase by the same rate of 1% while the same behavior also occurs when there is a decrease in this activity (Noreen 1991). On the other hand, fixed costs do not change in size when the volume of activity increases or decreases, and remain unchanged and constant. However, as in the traditional cost accounting model, costs are characterized as either fixed or variable relative to the cost driver, it assumes that changes in costs depend only on the change in activity and not on whether there is an increase or decrease in the change in that activity. That is to say, the direction of this change is not taken into account, and therefore the model of analogue behavior was

quickly questioned and scrutinized by many researchers who disagreed with this characterization of cost behavior because it was inconsistent with the way that administrations manage cost issues. While for many years proportional cost behavior has been in the forefront, new theories have emerged about how costs are related to changes in activity and what factors affect it. Thus, in line with earlier research, it has been found that costs increase more with increase in activity than decrease with corresponding decrease in activity (Cooper and Kaplan 1998 p 247, Noreen and Soderstrom 1997). This cost behavior phenomenon has been called sticky, namely costs are labeled as sticky when the percentage increase in costs from an increase in the cost driver is greater than the decrease in costs from a proportionate reduction in the cost driver (Anderson, Banker and Janakiraman 2003). Another distinction about the costs associated with a particular activity according to Cooper and Kaplan (1992) is engineered and committed. The costs included in the category of engineered (such as sales commissions) are proportionate to the resources provided and in turn these resources are proportionate to the resources ultimately consumed according to the volume of activity. Because of this successive relationship, it is understood that these costs are the same as those of the variables and thus cannot exhibit sticky behavior, which is characterized by an asymmetric response to cost driver increases or decreases. However, as opposed to committed costs (such as salaries paid to support sales) the committed resources provided are not always equal to the committed resources eventually consumed, so administrations first determine the level of committed resources. In the case that the committed resources required for consumption exceeds the level initially set, then the resources available to execute the activity will be strained, leading the management to increase the pool of resources. Whereas if the resources required are less than those set, then there will be a relative slack, which does not force the management to make a corresponding reduction in the resources allocated. Let us take as an example the salaries paid in support of sales which are committed costs. Initially, management will set a level of committed resources that they think will be needed to meet the needs of sales, but if sales reach a level that exceeds the set size of the committed costs then management is forced to increase these costs so that to meet customer needs. In the short term, it will be able to fill this gap by paying overtime that staff will need to carry out, and if the time

required for resources remains high then it will have to hire additional staff. However, if sales are at a low level where there is no need to consume the full amount of committed resources then the slack phenomenon will occur and the committed resources will be characterized as excessive. But management will not feel the same pressure to make a change (decrease) in reserved resources especially if it considers that this sales decline is transient and sales are expected to increase. Based on the above, we conclude that the phenomenon of sticky cost behavior occurs when the bound costs are not at the level required by the volume of activity.

2.3. Sticky behavior

This asymmetric behavior was investigated (Anderson, Banker and Janakiraman 2003) on the costs of administration and disposal in a sample of industrial enterprises, and the results of the survey showed that administration and disposal costs increased by 0.55% to an increase of 1 % of sales while the same costs are reduced by only 0.35% to a 1% decrease in sales. Introducing an alternative cost behavior model in which management deliberately adjusts resources according to cost driver changes as opposed to the traditional model of symmetrical behavior. The first attempt to extend Anderson, Banker and Janakiraman by using a comparative sample examining the costs of distribution and administration and the cost of sales to better understand the cost behavior and whether it depends on the absolute magnitude of the change in revenue was made by Subranamian and Weidenmier in 2003. Taking into account some of the corporate characteristics and the industry in which the company operates, they concluded that their findings are capable of confirming the Anderson, Banker and Janakiraman's conclusions. The behavior of these costs (disposal and management, costs of sales) can be studied in relation to sales as a cost driver as many of these costs are largely influenced by sales revenue (Cooper and Kaplan 1998, p. 341). These costs may amount to more than 26% of sales in most samples. Recent cost behavior studies have shown that costs do not change proportionally to changes in sales, but show that costs increase in response to increased sales but not a proportional decrease in sales reductions. Subramanian and Weidenmier 2003 research showed that sales costs and administration and distribution costs do not show sticky behavior for small changes in sales activity (anti-stickiness phenomenon). These findings suggest that stickiness

behavior stems from the fact that costs are not adapted quickly enough to large sales fluctuations. Small changes in activity can be managed with existing business resources while large changes cause management to make changes to total costs. Upward changes in costs occur when managers increase the costs and productivity of the business to respond to increased activity (eg sales) while downward when costs and redundant capacity decrease to comply with reductions in activity. Large upward changes in activity are usually followed by an immediate increase in costs, but in the case of large downturns in activity there may be no immediate reaction and cost reduction due to the belief that the reduction is temporary and there is optimism that things will change in the future positive outcome (Cooper and Kaplan 2003).

In particular, costs are sticky when sales change by more than 10%. In the event of an increase beyond that, management must increase the productivity of the business by changing the level of committed resources. In the case of a sales drop of more than 10%, management may be unwilling to reduce productivity, thereby causing sticky behavior (Subramanian and Weidenmier 2003). There are two theories that explain the cause of stickiness behavior. One proposes that costs become sticky as a result of management decisions that choose to handle any situation. When administrations experience a decrease in sales, this reduction may be considered temporary, so they expect sales to rebound in the near future. In this case, the administrations make a deliberate decision to keep intact the resources allocated to the operating activities of the business in times of declining sales. The other theory holds that sticky behavior is the product of the assumption that cost reductions cannot keep pace with sales declines. As mentioned above, costs have been reported to be sticky when there is a large drop in sales and this may result in costs not adjusting fast enough to keep pace with reduced sales.

2.4. Agency Theory

To elaborate more on this, taking into consideration what Cooper & Kaplan (1998) claimed, managerial behavior is explained as follows: when demand in activity is low, it is more possible for underutilized resources to be presented (with no subsequent decline of the variable cost) than rejecting a costly contract. In such a case, the decline of revenues and costs is not expected to be proportional. The correlation between the

phenomenon of cost stickiness and managers' behavior has been studied by Banker & Byzalov (2014) as well. Adjustment costs are disintegrated and thought of being caused on purpose by managerial behavior. The results are that cost stickiness conditional on a prior sales increase and cost antistickiness conditional on a prior sales decrease. Taking into account the assumptions mentioned before a structural idea of optimal decisions can be formed, including adjustment costs and managers' estimations regarding changes in the future sales as a result if the influence of previous changes in sales. Kama & Weiss (2013) investigate managerial motives regarding resources adjustments. The emphasis of their research has been placed on the influence of managerial motives to reach earning targets regarding resource adjustments and the subsequent cost structures. The results they draw indicate that

Managers have agencydriven opportunities to change assets (reduce costs when sales drop) and reduce the degree of cost stickiness to meet the expectations of financial an alysts and avoid losses.Chen, Lu & Sougiannis, (2011), analyze the asset change manag ement choices. They concentrate on selfinterest managers ' decisions and affirm aware ness of current managers ' opportunities to smooth the expense stickiness phenomeno n in order to achieve earnings targets. Kallapur & Eldenburg, (2005), also connect the cost stickiness phenomenon with agency problems in their study. Their research focused on Washington State Hospital, and findings suggest that the trend was stronger in hospitals where most patients were clients of a particular insurance agency. In their report, Governance Structure & Political Factors ' Calleja et al. (2006) examine a sample of U.S., U.K., France and Germany companies to exclude inferences about the value stickiness phenomenon. Their findings suggest, among others, that cost stickiness is due to gaps in the corporate governance system and the legal system. Businesses are run by a coalition of external and internal interest groups in the corporate governance code-law system. The common-law corporate governance model, in comparison to the UK and the US, places the greatest focus on the notion of investor maximization and the position of the stock market as a means of achieving that goal. Our findings suggest that states, like France and Germany that are subject to code-law governance structures appear to face more sticky costs. Cohen, Karatzimas & Naoum, (2015), confirm the cost stickiness trend which shows evidence of cost action

in Greek local governments, conclude that local government managers are changing the cost of service provision (core activity) faster.

Commenting on political factors and cost behavior Lee, Pittman & Saffar, (2016), extract evidence about the phenomenon of cost stickiness in local governments' service provision activities, and they conclude that it is greater in election years relative to nonelection years. Yao & Kening, (2018), on their research on Chinese A-share market from 2008 to 2015 connect the phenomenon of cost stickiness with the level of the risk in Chinese corporations. They define firm's ownership as the key indicator in the connection of firm's risk and cost stickiness. The concentration degree of ownership is an important part of corporate governance, which reflects the strength of shareholders to a certain extent. Depending on the ownership structure different methods of the corporate governance are a firm's reality. That means that the largest shareholders may have different motivations to manage, supervise and constrain, thus cost behavior is affected and as a result firm's risk is affected.

2.5.Factors that Influence Sticky Behavior

The evaluation and analysis of sticky behavior was also researched nationally where data from companies operating in different countries were used. These surveys have shown that in Brazilian listed companies, the costs of administration and disposal are more strongly sticky than in the US (de Medeiros and de Souza Costa 2004), whereas in Japan the behavior is similar concerns the sticky phenomenon with the US ones. According to a 2006 study by Calleja et al who compared the phenomenon by including in their sample US-listed companies, the United Kingdom, France and Germany concluded that operating costs increased on average by 0.97% when revenue increases by 1% while in the corresponding decrease in revenue these costs are reduced by only 0.91%. Also, according to the same study, the sticky phenomenon is more evident for French and German companies than for the US and UK companies, which is mainly due to the legislative framework of these governments and the less historical pressure from the markets. Cost behavior is also influenced by the sector in which the company operates, and may vary between different sectors as each sector has its own production and operating environment linked to different technologies, product markets and different legal frameworks. Each sector has its own characteristics in

terms of stock, ownership, machinery and equipment. Results of a Subramanian and Weidenmier (2003) survey focusing on data collection from different sectors have clarified the industry as the one with the stickiest cost behavior due to high stocks and tangible assets, while the least sticky sector is that of sales and promotion because of the fierce competition in this type of employment. With respect to the remaining 16 sectors, the financial sector has some stickiness that derives primarily from interest expense, and the same applies to the driver-driven services sector as well as the volume of stocks and employees. Also, the banking sectors of countries such as Argentina, Brazil and Canada (which have similar cost structure and economies of scale) confirm the existence of stickiness. Costs can be sticky when they relate to core business functions. According to a study by Balakrishman and Gruca (2008) evaluating data from companies in the health industry, they compared the behavior of costs that are directly related to the operation of the main components and the operating costs that are related to the ancillary parts and are not directly related to the main care mission of a hospital. The conclusion of this study is that stickiness only showed costs that are directly related to the core functions and segments, while the other costs did not behave the same. Evidence from previous research has shown that various elements of corporate governance affect asymmetry in management and distribution costs. There has been a positive correlation between the degree of stickiness and representation problems (Chen et al. 2012), as well as that earnings prediction is influenced by stickiness behavior and more specifically that firms with more severe stickiness have less accuracy in their profit forecasting than in those where the phenomenon occurs with less intensity (Weiss 2010). The cost-stickiness phenomenon is largely linked to the decisions and strategies that managers make in managing their resources in order to maintain or adjust, adjust, the volume of these resources in the event of an activity (ex. sales) decreased. Adjusted costs include the costs of recruiting, hiring, training new staff, and the ethical costs of hiring and firing employees. When adjustment costs (i.e. financial sacrifices, costs arising from contracts etc. appear when they have to be made, cost adjustment) is high, then management is most likely not to make any changes in order not to be burdened with these additional high costs (Anderson, Banker and Janakiraman 2003, Calleja, Steliaros and Thomas 2006).

On the other hand, as regards the expectations of expected sales, when they are negative and sales are expected to decline, then it is more likely that there will be a shift to lower costs, thereby reducing the stickiness effect. Vice versa, sales are expected to grow and, in the case, that the company will not make any adjustments, the stickiness appears more intense. Keeping resources intact in cases where high profitability is expected on the management side also leads to more intense stickiness (Chen, Lu and Sougiannis 2012). According to Banker and Byzalov (2014), management decisions, in addition to current sales, also depend on other factors such as the level of prior sales and future sales that affect adjusted costs, and factors such as the behavior of individual members of management and in the way, they work and make decisions. The model that defines sticky cost behavior recognizes that the costs incurred in the current year depend to some extent on the costs incurred in the prior period. Thus, the level of activity in the current year as well as the level of costs and activity of the previous year affect the costs incurred in the current period compared to the traditional model of cost behavior (fixed / variable costs), which argues that the level of current costs depends only on the volume of activity actually carried out in the current period. This dependency arises mainly due to the fact that the sticky costs appear because of management's decisions to adjust or not to the commit resources according to changes in activities. Managers use cost accounting data to make decisions about the levels of imports (raw materials, etc.) and exports (finished products, etc.), in order to maximize their profits over the long term (what we call cost management). The key component of cost management is the way that administrations decide to respond to external factors that affect the demand for the products or services they offer and the offer of supplies needed to run their businesses. Similar conclusions were substantiated by Balakrishman et al 2004, who analyzed the impact of management's manipulation of production capacity as a result of changes in activity (cost driver). Sticky behavior is largely linked to the firm's production capacity and changes in the selling prices of finished products or services, when management adjusts production capacity to sales volume. It is possible that business executives choose to keep their production capacity at constant levels, despite the decline in demand, either because this process is usually costly or because demand in the future is likely to return to the desired level. In particular, sticky costs

can occur when the marginal cost of increased productivity, in the event of increased demand, outweighs the marginal benefit due to reduced capacity in response to reduced demand. In addition, behavioral stickiness is more pronounced in terms of earnings when administrations drop prices in times of high demand and less strongly when prices rise in times of demand (Cannon 2011). Also, the change in the size of the economic activity is affecting and is the cause of the appearance of stickiness, as relatively large increases in sales lead to asymmetric cost behavior (Balakrishnan, Peterson, and Soderstrom 2004). An important factor in the appearance of stickiness is the competences, skills of the members who make the key decisions and shape the strategy that the company will implement, in order to establish its presence in its competitive environment. These skills are the intellectual capital of the business, as they are crucial to the effective response and management of the risks faced by the business, and are part of the intangible assets that are highly linked to the stickiness of costs, taking into account that companies with significant intangibles assets exhibit a higher degree of cost-behavioral asymmetry (Venieris et al. 2015). Some research has focused on the assessment of stickiness in small and medium-sized companies that examined the difference in asymmetric behavior between large and small size by assessing access to capital, cost adjustment, representation and optimism as potential determinants. . The findings showed a correlation between stickiness and company size (Cheng et al. 2012) (Bosch and Blandon 2011). Nicola Dalla Via and Paolo Perego's 2013 research focused on evaluating the phenomenon of unlisted SMEs in Italy (and then comparing results with listed companies) on operating costs, cost of sales and labor costs, with the results showing that the stickiness phenomenon occurs only in listed companies and mainly for labor costs. The stickiness phenomenon has also been combined with the strategy the company chooses to follow to survive in the market it aims, in order to gain as much market share as possible. Ballas et al 2015 studied the effect of stickiness on the costs of disposal and administration in companies that designate prospectors and defenders, according to their strategy. According to Miles and Snow, prospectors are innovative and research companies that take risks with the introduction of new products aimed at economic growth through exploiting market opportunities, while defenders are businesses focused on managing their product portfolio effectively, so as to grow through further market penetration and cost-

effective management. The results of the survey showed that business strategy is a key factor in the asymmetry of marketing and distribution costs with business prospectors showing increased stickiness while defenders exhibit an anti-stickiness cost behavior. However, in many cases there is also the phenomenon of anti-stickiness, where costs are reversed asymmetrically according to the change in activity, that is, the costs in a percentage change in the cost driver are reduced to a greater extent than they increase to a corresponding increase in the cost guide (Balakrishnan, Peterson, and Soderstrom 2004).

2.6.Other theories connected with sticky behavior

Here is explained the Sticky wage theory, which is very common at years that economy goes downturn.

The sticky wage theory applies that workers' earnings respond slowly to the changes in the performance of a company or the economy. According to the theory, when the amount of people that are unemployed increases, the amount of wages of those employees that continue working at these companies tend to stay the same or grow at a slower rate than before rather than falling with the decrease in demand for labor. In particular, wages are often said to be sticky-down, meaning that they can move up easily but move down only with difficulty.

Stickiness, in general, is also often called "nominal rigidity" and the phenomenon of sticky wages is also often referred to as "wage stickiness."

There are other theories about the cost stickiness phenomenon which argue that labor is associated with cost behavior. For example, a study was done by Jamilio, Schiantareli and Sembeneli (1993) to demonstrate this connection. They have been successful in confirming their theory, as the demand for these companies has increased at a time when the demand for labor has increased. On the other hand, in times when demand fell below the usual level, there was no reverse trend, namely the layoff of labor. More recent research by Goux, Marin and Panchel (2001) on the same subject, was also conducted. In particular, they surveyed the French labor market with a sample of 1000 companies. Their study was based on a model that argues that labor demand is influenced by both the costs incurred when a company employs staff and the cost of

firing staff. To draw their conclusions, they based on panel data and their results show a sticky behavior in terms of labor demand in relation to the two costs mentioned above. In other words, the results have shown that it is more costly for a company to fire employees, especially if they have an indefinite contract rather than hiring employees. This asymmetry between redundancy and recruitment costs creates cost stickiness. In addition, they found that the cost stickiness phenomenon becomes more pronounced when there are non-productive rather than productive workers. More recent research on this topic has been continued by Bankers, Byzalon and Chen (2013) who studied the behavior of managers in decisions regarding their company staff. According to them, it is not common for managers to fire employees when business activity declines as opposed to increasing demand where they are more willing to hire staff to meet business needs. Comparing the two costs, it is obvious that if it is 'more expensive' to fire a worker than to hire a worker, then potential workers are more likely to find work in times of high demand than in times of reduced demand. In this way, Bankers, Byzalon and Chen explain that the cost stickiness phenomenon directly relates to managers' decisions about the workforce as well as decisions about the business activity. Finally, as the business experiences a decline in demand its resources remain unchanged, so does the cost stickiness. A final theory on the subject was made by Guanter, Riehl and Robler (2014) who study the phenomenon based on the reputation of each business. More specifically, the above analysts explain that the fear of bad reputation from the fact that the company fires employees creates cost stickiness. More illustratively, in times of low demand, it is more difficult for the business to cover the fixed wage costs of employees, especially if they are highly skilled and overqualified. However, the company keeps them in their human resources and does not dismiss them, hoping that in the future things will get better with the sticky cost behavior of employees.

3. Case Development

In this study, taking into account the literature and the factors that influence the occurrence of sticky behavior at various cost types, we will examine whether the costs of goods sold to small and medium-sized enterprises in Greece exhibit such behavior. The purpose is to examine the existence of sticky behavior by comparing the change in the cost of sales in times of increased sales and the change in the costs of sales in times when sales are declining, ie the Greek crisis. Regarding the costs of sales we expect that there will be no sticky behavior mainly due to the fact that these costs are strongly linked to production levels and therefore to sales volume so they are more likely to exhibit an anti-sticky behavior, ie costs increase less in an increase in sales volume than they decrease in the event of an equal decrease in sales volume.

Case - Zero Hypotheses (Ho): The percentage increase in the cost of sales as a result of a percentage increase in sales is more than the percentage decrease in the cost of sales as a result of an equal percentage reduction in sales. (stickiness phenomenon- we expect to reject it)

Unlike engineered resources, committed resources are not directly related to the cost driver (in our case sales). Administrations should intervene to adjust the level of committed resources and this presupposes that there may be a delay as soon as there is a change in sales (or any cost drivers), until the administrations decide to adjust the committed resources. It is also very likely that there will be a delay, because it takes some time to make any decision to change the pool of resources, for example it takes a reasonable amount of time to recruit new staff, if there is an increase in sales, or, vice versa reductions take time to complete the decommissioning process. The factors that cause stickiness behavior may cause reductions in pooled resources, in cases where the cost driver decreases, but these adjustments appear to be more delayed than the corresponding adjustments made in response to cost driver increases. Noreen and Soderstrom (1997) took issue with this and suggested that the pressures for increases in committed resources could be managed for some time, but ultimately the need for increases should be satisfied. As is the case of a reduction, where initially the same intense pressure is not created for administrations to immediately change, there

should be some adjustment as the non-response to the reduction in cost drivers will be reflected in periodic accounting performance measurements. If sales reductions occur for successive periods, management is now assessing the likelihood that these reductions will not be a temporary situation but a permanent one. In the second year of a steady decline in sales, administrations that take into account the financial consequences of their actions will be more willing to reduce the level of committed resources provided.

3.1. Empirical Analysis

The data collection was done from the AMADEUS database, which we had free access to from the International University, and concerns small and medium-sized companies operating in the Greek business world. Companies can be distinguished according to the European Commission depending on the number of employees employed in the company, its sales as well as its total assets.

In the present study, turnover was selected as the criterion for company size, and the thresholds for defining a company as small or medium were set so that they would have all the profits and not have zero sales. Taking into account the above defined criterion data were collected for 182 small and medium enterprises and with excel filters we ended up with 139 Greek Small Medium sized from all sectors (from consolidated data to avoid duplicates in the sample) regarding the cost of goods sold, sales and turnover of these businesses for the years 2010 to 2018. After the initial data collection, businesses that may have been subject to sampling errors due to tax scandals, such as Folie Folie as well as other closed ones such as Teletypos SA were excluded from the sample. Further checks were carried out to remove the duplicate sample and a set of sales and costs data for 2010-2018 was formulated. The actions taken for the sample concerned the removal of observations where no data were available either on sales (if anything went away) or on costs sold for the current year or years, as well as observations where costs of the sold exceeded sales in the respective current years. Finally, the samples retained only the positive sales and cost values, which is required in the logarithmic form of the model used in conducting the research. The model used in the investigation is appropriate for measuring the cost response of sales to sales changes and for distinguishing whether there is a decrease

or increase in sales between the periods considered. The basic model is as follows and has been used in a wide range of research efforts with the first application by Anderson, Banker and Janakiraman (2003). In their model, Anderson, Banker and Janakiraman's determine allocation and administration expenses as a function of revenue, starting from the calculation of the proportion of distribution and administration expenses (revenue) in the current period to the allocation and administration expenses (revenue) of the previous period and then transforming these variables in logarithmic form. To measure stickiness behavior, Anderson, Banker and Janakiraman's enter a discrete variable that takes the value 1 when the revenue for the current period is lower than the revenue for the previous period, and then this discrete variable is multiplied by the calculated percentage of revenue for the current period to the revenue of the previous period. In this research, this model was adapted to the data available to us, and the costs of disposal and administration were used for the costs of sales and the sales revenue of the business for the years of the survey was used.

A key concern of the research is to measure whether the costs of sales change as a result of the decrease or increase in sales between seasons. For this reason the independent variable is the quotient of costs in t period to the cost in t-1 period which shows us the change in cost, while the one dependent variable, because we want to study the effect of sales change on in the dependent variable, is the quotient of sales in t period to sales in t-1 period. As an extension of the model, on the grounds that we want to include the direction (increase or decrease) of sales change, not only the magnitude of this change was used, but also a discrete variable (Dummy), which takes the value 1 when there is a decrease in sales between seasons t-1 and t, otherwise it takes the value of 0. In this way, the second independent variable which is the product of the discrete variable on the sales quotient (change) is formulated. The model provides the basis for measuring sticky cost behavior.

If the traditional fixed cost model is valid it means that the upward and downward changes in costs will be equal to the result that the coefficient b2 equals 0. Additionally, if constant costs are present, there are economies of scale (b1 <0). Since data is cross-sectional in nature with variations across sectors and some variations in

business size, logarithmic form (and the appearance of variables as percentages) improves the comparability of variables between businesses and reduces as much as possible heteroskedasticity. Using the Dummy discrete variable and, since this variable equals 0 when sales increase, the coefficient b1 measures the percentage increase in costs when there is a 1% increase in sales. In the case that the discrete variable equals 1, when sales decrease, then the sum of the coefficients b1 + b2 measures the percentage reduction in costs when sales fall by 1%. If the costs under consideration are sticky, then the fluctuation of costs, when sales increase, should be greater than the fluctuation in the event of a decrease in sales, and, thus, assuming that the coefficient b1 is positive, then the coefficient b2 should be negative.

3.2. Cost of goods sold and stickiness phenomenon

The initial variables used in the research consisted of the costs of sales and business sales expressed in millions, obtained from the International University's AMADEUS database, to which, as mentioned above, we have free access. The sample data includes companies from various sectors in the Greek area, but does not include firms operating in the field of financial, banking and investment services. Also, companies that went bankrupt, were merged (mergers or acquisitions) or were fraudulent (e.g. Folie Folie) are not included. For all the analysis bellow, the tables are shown at the chapter “Appendix”.

The original sample consisted of a total of 182 firms with positive sales prices and costs sold for the years 2010 to 2018. Initially, data was imported to STATA with copy paste. Every action is presented above at the Appendix. The first action was to convert variables from string to numeric. Subsequently, the observations that were missing values were subtracted either for the costs sold or for the sales for the current or previous period. Subsequently, observations were removed where the costs of sales exceeded sales in the current period. It is important to emphasize that only positive values for both costs of sales and sales have been retained. The final sample consisted of 136 firms and a total of 1088 observations (*Table 1*) with an average of 8 observations per group. Stata can't run string variables so we used the command "egen" (*Table 2*) to convert company names to the corresponding numbers. Then, a dummy variable is created which has the value of 0 and gets the value of 1 when sales

drop next year. To achieve this, it was necessary to create lag operators for sales in the following and previous years. . The command xtset declared that our data is in panel format. The panel is strongly balanced, so all companies have data for years under scrutiny. After setting the panel, we run the robust command and found that all variables change over time, so there is no heterogeneity over companies or over years. After running the OLS regression we can observe that R2 = 0.9409, so the 94.09% of the cost change is explained by the change in sales. We should not forget that this model just takes the data and applies to the last model ignoring the fact that is panel data and all coefficients don't vary, so it is restrictive. With regard to the choice between random effects and fixed effects, our main goal is not only to analyze the relationship between the cost of goods sold and the yearly sales but also to take into account that the differences between entities have an impact on the cost of goods sold. Thus, the regression with random effects was chosen. Direction is the discrete variable (dummy) and takes the value "1", when there is a decrease in sales from period t-1 to period t, while in the other case (increase) it takes the value "0" (*Table 3*). Finally, we came to the conclusion of the case that we are studying, that is, if the percentage increase in sales costs as a result of a percentage increase in sales is bigger than the percentage reduction in costs sold as a result of an equal decrease in sales which is opposite from what other authors have concluded through years for cost of goods sold..

The results are represented at Appendix. From the tables we can see if the variables we test are statistical significant for our companies in the years under scrutiny. This can be understood if we look at their p-values. For all the p-values we see that all p-values are zero so less than 0.05 so we reject the zero hypotheses ($\mathbf{H_0}$) that cost of goods sold is "sticky". We can observe that all variables are statistical significant for the pooled method because their p-values are smaller than 0.05 and in fact equal to zero. So, both sales and direction affect cost. On the one hand, from their coefficients we see that when we have an increase in sales by 1 (dummy=0) (see *Table 4*), the cost of sales increases by 3.1. In this case the 97 % of sales explains cost (R squared=0.97). On the other hand, when we have a decrease in sales (dummy=1) (see *Table 5*), we can observe that if sales decrease by 1 then cost will increase by 0.82. In this case the 56 %

of sales explains cost (R squared=0.56). That means the traditional fixed cost model is valid and the upward and downward changes in costs will not follow proportionally.

Using the direction (dummy variable) and, since this variable equals 0 when sales increase, the coefficient b1=3.1 measures the percentage increase in costs when there is a 1% increase in sales, thus costs increase 0.031 %. In the case that the discrete variable (direction) equals 1, when sales decrease, then the sum of the coefficients b1 + b2 = 3.1 +0.82 =3.92 measures the percentage reduction in costs when sales fall by 1%, which is bigger than in an increase, and shows no sticky behavior. The zero Hypotheses is as follows:

The percentage increase in the cost of sales as a result of a percentage increase in sales is more than the percentage decrease in the cost of sales as a result of an equal percentage reduction in sales.

In this case, the increase of sales is less than the decrease of sales (3.1<3.9). So, cost of goods sold seems to have an anti- sticky behavior for our sample. Also, the difference between years is less than 10%, so there is no sticky behavior. This result comes along with the theories around cost of goods sold. These results might be due to the fact that all coefficients are zero and the sample might be not enough to explain this behavior. Also, something might have gone wrong due to the structure of data that were inserted to Stata.

4. Conclusions

The present study focuses mainly on the study of a sample of small and medium-sized enterprises, with the aim of examining the existence of stickiness of the cost behavior of the cost of goods sold and whether it exists in a size category that has not been extensively covered by prior research work, as the majority of studies have focused on large-scale samples of listed companies or the sticky behavior of operating costs. Focusing on businesses in the Greek business space provides the ideal content to broaden the literature on this subject, as the Greek economy is mostly made up of small and medium-sized businesses. The objective of the research was to assess the cost behavior and the possible stickiness of the cost behavior of the sold, in relation to the changes in sales. The results show that the costs of goods sold demonstrate an anti- stickiness behavior as the percentage increase in sales to 1% increase in cost is less than the percentage decrease in cost of goods sold to sales decline 1%. This behavior is mainly due to the relationship between the costs with the cost driver, that is to say sales and, consequently, with the production process, which results in the more immediate adjustment of this cost type to changes in sales. Also, it might be influenced by the decisions of the management and the time s needed to take actions. Also, the limitations that appeared in the conduct of this thesis and had an impact on the research findings are presented. First, the use of sales as a cost driver (cost-effective activity) is common in the literature, but the conclusions should be carefully evaluated. Sales are also affected by changes in sales prices as well as by other factors and not just management decisions. Second, the time horizon for the survey sample covers only 9 years 2010-2018, and the fact that differences were needs we came with 8 years, while in other empirical studies this horizon is extended to over 20 years. Once stickiness reveals a behavior that occurs over time, this very small comparative time horizon could affect the results of the research. To further expand and broaden the analysis and estimation of stickiness behavior in costs related to small and medium-sized Greek enterprises, studies on larger samples of companies of this size could be undertaken for longer periods to provide a more in-depth view covering greater scope of the Greek economy. The estimation of these samples would provide enlightening

findings, if their analysis focused on the benchmarking of the individual sectors of the Greek economy separately. In addition, it would be feasible, provided that data availability, behavioral assessment and other types of costs such as labor costs and disposal and administration costs were available. Finally, since the present work was used as a cost driver, business sales could be used, depending on the type of cost estimated, and other drivers such as total assets and number of employees. Those information was hard to find.

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Appendix

Table 1

```
. tsset id timeid
       panel variable:  id (strongly balanced)
        time variable:  timeid, 1 to 8
                delta:  1 unit

. sum
```

Variable	Obs	Mean	Std. Dev.	Min	Max
companyname	0				
year	1,088	2014.5	2.292342	2011	2018
sales	1,088	3.33e+08	1.21e+09	34308	1.05e+10
dsales	1,088	1.066896	1.218287	.001	38.9888
cogs	1,088	2.88e+08	1.11e+09	28757	9.90e+09
dcost	1,088	1.150203	3.782004	.0002	124.7979
id	1,088	68.5	39.27681	1	136
timeid	1,088	4.5	2.292342	1	8
dummy	1,088	.4641544	.4989428	0	1
lagsales	1,087	3.33e+08	1.21e+09	34308	1.05e+10
nextyearsa~s	1,087	3.33e+08	1.21e+09	34308	1.05e+10
direction	1,088	.4711944	.5838752	0	8.2208

Table 2

```
. egen id=group(companyname)

. duplicates drop

Duplicates in terms of all variables

(0 observations are duplicates)

. drop if sales==. & dsales==. & cogs==. & dcost==.
(0 observations deleted)

. drop if sales==- & dsales==- & cogs==- & dcost==-
invalid syntax
r(198);

. drop if sales==.
(0 observations deleted)

. drop if dsales==.
(136 observations deleted)

. drop if dcost==.
(0 observations deleted)

. egen timeid=group(year)
```

Table 3

```
gen dummy=0

. egen salesyearid=group(id timeid)

. drop salesyearid

. gen lagsales=sales[_n-1]
(1 missing value generated)

. gen nextyearsales=sales[_n+1]
(1 missing value generated)

. replace dummy=1 if nextyearsales<sales
(505 real changes made)

. gen direction=dummy*dsales

. drop if direction==.
(0 observations deleted)
```

Table 4

```
. xtreg dcost dsales,re, if dummy==0

Random-effects GLS regression                   Number of obs     =       583
Group variable: id                              Number of groups  =       135

R-sq:                                           Obs per group:
     within  = 0.9668                                         min =         1
     between = 0.9735                                         avg =       4.3
     overall = 0.9682                                         max =         8

                                                Wald chi2(1)      =  17697.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

dcost	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dsales	3.133112	.0235513	133.03	0.000	3.086952	3.179271
_cons	-2.21657	.0461605	-48.02	0.000	-2.307043	-2.126097
sigma_u	0					
sigma_e	.92826732					
rho	0	(fraction of variance due to u_i)				

Table 5

```
. xtreg dcost dsales,re, if dummy==1

Random-effects GLS regression                   Number of obs     =       505
Group variable: id                              Number of groups  =       135

R-sq:                                           Obs per group:
     within  = 0.5113                                         min =         1
     between = 0.5615                                         avg =       3.7
     overall = 0.4863                                         max =         8

                                                Wald chi2(1)      =    476.16
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

dcost	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
dsales	.8270864	.0379032	21.82	0.000	.7527976	.9013753
_cons	.1762862	.0417303	4.22	0.000	.0944962	.2580762
sigma_u	0					
sigma_e	.36964094					
rho	0	(fraction of variance due to u_i)				